

1 CLAIMS

2 1. A method comprising:
3 receiving non-native words of a non-native language and at least one native
4 word of a native language that are entered by a user; and
5 converting the native word to a corresponding non-native word.

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7 2. A method as recited in claim 1, wherein the non-native language is
8 English and the native language is Chinese.

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10 3. A method as recited in claim 1, wherein the non-native words are
11 English words and the native word is Chinese Pinyin.

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13 4. A method as recited in claim 1, wherein the native word is written in
14 phonetic text.

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16 5. A method as recited in claim 1, further comprising displaying the
17 non-native words and the native word within a common entry line.

18
19 6. A method as recited in claim 1, wherein the converting comprises
20 determining a most probable non-native word given a context established by the
21 non-native words previously entered by the user.

22
23 7. A method as recited in claim 1, wherein the native word is entered in
24 phonetic form, the converting further comprising:
25 translating the native word from the phonetic form to a language form; and

1 translating the native word in the language form to the non-native word.

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3 8. A method as recited in claim 1, wherein the native word is entered in
4 phonetic form, the converting further comprising:

5 determining a most probable language form of the native word and
6 translating the native word from the phonetic form to the most probable language
7 form; and

8 determining a most probable non-native word given the most probable
9 language form of the native word.

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11 9. A method as recited in claim 1, wherein the native word is entered in
12 phonetic form and the converting comprises translating the native word from the
13 phonetic form to one or more native words in a language form, the method further
14 comprising displaying the one or more native words in the language form.

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16 10. A method as recited in claim 9, further comprising:
17 displaying the non-native words and the phonetic form of the native word
18 within a common entry line; and

19 displaying the one or more native words in the language form within a pop-
20 up box adjacent the entry line.

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22 11. A method as recited in claim 10, further comprising ordering the
23 native words within the pop-up box according to probabilities.

12. A method as recited in claim 10, further comprising enabling a user to scroll within the pop-up box.

13. A method as recited in claim 1, wherein the native word is entered in phonetic form and the converting comprises:

translating the native word from the phonetic form to one or more native words in a language form;

displaying the one or more native words in the language form;

translating at least one of the native words in the language form to one or more non-native words; and

displaying the one or more non-native words.

14. A method as recited in claim 13, further comprising:

displaying the non-native words and the phonetic form of the native word within a common entry line; and

displaying the one or more native words in the language form within a pop-up box adjacent the entry line.

15. A method as recited in claim 13, further comprising:

following translation to the one or more non-native words, displaying the non-native words and the language form of the native word within a common entry line; and

displaying the one or more non-native words within a pop-up box adjacent the entry line.

1 **16.** A method as recited in claim 1, further comprising displaying a
2 bilingual sentence pair having a native sentence written in the native language and
3 including the native word and a corresponding non-native sentence written in the
4 non-native language and including the non-native word.

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6 **17.** One or more computer-readable media having computer-executable
7 instructions that, when executed on a processor, direct a computer to perform the
8 method as recited in claim 1.

9
10 ~~**18.**~~ A method comprising:
11 displaying, via a user interface, character strings in a first language together
12 with at least one character string of a second language as the user enters the
13 character strings;
14 converting the character string of the second language to another character
15 string of the first language; and
16 replacing the character string of the second language with said other
17 character string of the first language in the user interface.

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19 **19.** A method as recited in claim 18, wherein the first language is
20 English and the second language is Chinese.

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22 **20.** A method as recited in claim 18, further comprising displaying the
23 character strings of the first and second languages within a common entry line.
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1 **21.** A method as recited in claim 18, wherein the converting comprises
2 determining a most probable character string given a context established by the
3 character strings previously entered by the user.

4
5 **22.** One or more computer-readable media having computer-executable
6 instructions that, when executed on a processor, direct a computer to perform the
7 method as recited in claim 18.

8
9 **23.** A method comprising:
10 receiving non-native words of a non-native language and at least one native
11 word of a native language that are entered by a user; and
12 presenting a candidate list of non-native words that are possible translations
13 of the native word.

14
15 **24.** A method as recited in claim 23, wherein the non-native language is
16 English and the native language is Chinese.

17
18 **25.** A method as recited in claim 23, further comprising displaying the
19 non-native words and the native word within a common entry line.

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21 **26.** A method as recited in claim 23, further comprising presenting a
22 sentence window with bilingual sentence pairs.

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1 27. One or more computer-readable media having computer-executable
2 instructions that, when executed on a processor, direct a computer to perform the
3 method as recited in claim 23.

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5 ~~28.~~ A method comprising:
6 receiving non-native words of a non-native language and at least one native
7 word of a native language that are entered by a user, the native word being entered
8 as phonetic text; and
9 presenting a list of one or more translations of the native word written in a
10 language text.

11
12 29. A method as recited in claim 28, wherein the non-native language is
13 English and the native language is Chinese.

14
15 30. A method as recited in claim 28, further comprising displaying the
16 non-native words and the native word within a common entry line.

17
18 31. A method as recited in claim 28, further comprising presenting a
19 sentence window with bilingual sentence pairs.

20
21 32. One or more computer-readable media having computer-executable
22 instructions that, when executed on a processor, direct a computer to perform the
23 method as recited in claim 28.

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33. A method comprising:

receiving non-native words of a non-native language and at least one native word of a native language, the native word being received in a first form of the native language;

translating the native word from its first form to at least one native word of a second form;

translating the native word of the second form to at least one non-native word.

34. A method as recited in claim 33, wherein the non-native language is English and the native language is Chinese.

35. A method as recited in claim 33, wherein the non-native words are English words and the first form of the native word is Chinese Pinyin and the second form of the native word is Chinese Mandarin.

36. A method as recited in claim 33, wherein the translating the native word from its first form comprises selecting a most likely native word of the second form based on statistical probabilities.

37. A method as recited in claim 33, further comprising accepting misspelled versions of the native word in the first form.

1 **38.** A method as recited in claim 33, further comprising displaying the
2 non-native words and the native word within a common entry line.

3
4 **39.** A method as recited in claim 33, wherein the translating the native
5 word from its second form to the non-native word comprises:

6 determining possible non-native word candidates from the second form of
7 the native word;

8 generating first probabilities associated with the non-native word
9 candidates that indicate how likely individual non-native word candidates were
10 intended by the user given the context established by previously entered non-
11 native words;

12 generating second probabilities associated with the non-native word
13 candidates that indicate how likely the second form of the native word was
14 intended given individual non-native word candidates; and

15 deriving a most probable non-native word from among the non-native word
16 candidates based on the first and second probabilities.

17
18 **40.** A method as recited in claim 33, further comprising replacing the
19 native word in its first form with the non-native word.

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21 **41.** One or more computer-readable media having computer-executable
22 instructions that, when executed on a processor, direct a computer to perform the
23 method as recited in claim 33.

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42. A method comprising:

enabling a user to enter non-native words of a non-native language and a phonetic text string of a native language;

displaying the non-native words and the phonetic text string within a common entry line;

translating the phonetic text string to at least one native word of the native language;

determining possible non-native word candidates from the native word of the native language;

generating first probabilities associated with the non-native word candidates that indicate how likely individual non-native word candidates were intended by the user given the context established by previously entered non-native words;

generating second probabilities associated with the non-native word candidates that indicate how likely the native word was intended given individual non-native word candidates;

deriving a most probable non-native word from among the non-native word candidates based on the first and second probabilities; and

translating the native word to the most probable non-native word.

43. A method as recited in claim 42, wherein the non-native language is English and the native language is Chinese.

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44. A method as recited in claim 42, wherein the non-native words are English words, the phonetic text is Chinese Pinyin, and the native word is Chinese Hanzi.

45. A method as recited in claim 42, wherein the translating the phonetic string comprises selecting most likely native words based on statistical probabilities.

46. A method as recited in claim 42, wherein the determining comprises using a bilingual dictionary to identify the non-native word candidates.

47. A method as recited in claim 42, wherein the generating first probabilities comprises using a statistical language model.

48. A method as recited in claim 42, wherein the generating second probabilities comprises using a translation model.

49. A method as recited in claim 42, further comprising displaying the most probable non-native word in place of the phonetic text string.

50. One or more computer-readable media having computer-executable instructions that, when executed on a processor, direct a computer to perform the method as recited in claim 42.

1 **51.** A cross-language input user interface comprising:
2 a line-based entry area;
3 non-native text displayed within the line-based entry area; and
4 native text displayed together with the non-native text within the line-based
5 entry area.

6
7 **52.** A cross-language input user interface as recited in claim 51, wherein
8 the non-native text comprises English and the native text comprises Chinese.

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10 **53.** A cross-language input user interface as recited in claim 51, wherein
11 the line-based entry area is oriented horizontally.

12
13 **54.** A cross-language input user interface as recited in claim 51, further
14 comprising converted non-native text, converted from the native text, substituted
15 for the native text within the line-based entry area.

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17 **55.** A cross-language input user interface as recited in claim 51, further
18 comprising a candidate list of non-native words that are possible translations of the
19 native text.

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21 **56.** A cross-language input user interface as recited in claim 51, further
22 comprising a candidate list of non-native words that are possible translations of the
23 native text, the non-native words being ordered within the candidate list according
24 to a ranking.
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1 **57.** A cross-language input user interface as recited in claim 51, wherein
2 the line-based entry area is oriented in a first direction and further comprising a
3 candidate list of non-native words that are possible translations of the native text,
4 the candidate list being oriented in a second direction orthogonal to the first
5 direction.

6
7 **58.** A cross-language input user interface as recited in claim 51, further
8 comprising a sentence window, invokable by a user, to present bilingual sentences
9 that include the native text and the non-native text.

10
11 **59.** A word processor comprising the language input user interface as
12 recited in claim 51.

13
14 ~~**60.**~~ A cross-language input user interface comprising:
15 an entry area that accepts first words written in a first language and at least
16 one second word written in a second language; and
17 a candidate list of first words that are possible translations from the second
18 word.

19
20 **61.** A cross-language input user interface as recited in claim 60, wherein
21 the first language is English and the second language is Chinese.

1 **62.** A cross-language input user interface as recited in claim 60, wherein
2 the entry area comprises a line-based entry area oriented in a first direction and the
3 candidate list is presented adjacent the line-based entry area and oriented in a
4 second direction orthogonal to the first direction.

5
6 **63.** A cross-language input user interface as recited in claim 60, further
7 comprising a sentence window, invokable by a user, to present bilingual sentences
8 written in the first and second languages.

9
10 **64.** A word processor comprising the language input user interface as
11 recited in claim 60.

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13 ~~**65.**~~ A cross-language input user interface comprising:
14 an entry area that allows a user to enter both English words and Chinese
15 Pinyin; and
16 a pop-up box with at least one Chinese word translated from the Chinese
17 Pinyin.

18
19 **66.** A cross-language input user interface as recited in claim 65, further
20 comprising, upon selection of a Chinese word from the pop-up box, a candidate
21 list of English words that are possible translations from the Chinese word.

1 **67.** A cross-language input user interface as recited in claim 66, further
2 comprising a sentence window, invokable by a user from the candidate list, to
3 present bilingual sentences written in English and Chinese to demonstrate usage of
4 a particular English word from the candidate list.

5
6 **68.** A word processor comprising the language input user interface as
7 recited in claim 65.

8
9 ~~**69.**~~ A cross-language writing architecture comprising:
10 a user interface to enable a user, who is accustomed to a native language, to
11 enter non-native words from a non-native language; and
12 a spelling tool to assist the user with correct entry of the non-native words.

13
14 **70.** A cross-language writing architecture as recited in claim 69,
15 wherein the user interface allows the user to enter a native word from the native
16 language instead of the non-native word, the spelling tool comprising a translator
17 to translate the native word to a corresponding non-native word.

18
19 **71.** A cross-language writing architecture as recited in claim 70,
20 wherein the translator utilizes a bilingual dictionary.

21
22 **72.** A cross-language writing architecture as recited in claim 70,
23 wherein the translator utilizes a statistical language model.
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1 73. A cross-language writing architecture as recited in claim 70,
2 wherein the translator utilizes a bilingual translation model.

3
4 74. A cross-language writing architecture as recited in claim 69,
5 wherein the spelling tool utilizes a thesaurus.

6
7 75. A word processor comprising the language input architecture as
8 recited in claim 69.

9
10 76. A cross-language writing architecture comprising:
11 a user interface to enable a user, who is accustomed to a native language, to
12 enter non-native words from a non-native language; and
13 a sentence recommendation tool to suggest possible sentence structures in
14 the non-native language.

15
16 77. A cross-language writing architecture as recited in claim 76,
17 wherein the sentence recommendation tool comprises:

18 a bilingual corpus containing bilingual sentence pairs written in both the
19 native language and the non-native language; and
20 a sentence retrieval unit to retrieve bilingual sentence pairs from the
21 bilingual corpus.

1 78. A cross-language writing architecture as recited in claim 77,
2 wherein the sentence recommendation tool ranks the sentences retrieved from the
3 bilingual corpus.

4
5 79. A word processor comprising the language input architecture as
6 recited in claim 76.

7
8 80. A cross-language writing architecture comprising:
9 a user interface to enable entry of English words together with Chinese
10 Pinyin;

11 a spelling tool to translate the Chinese Pinyin to one or more Chinese
12 words, the spelling tool being further configured to translate the Chinese words to
13 one or more English words that may be substituted for the Chinese Pinyin; and

14 a sentence recommendation tool, invokable by a user, to offer pairs of
15 corresponding sentences written in English and Chinese to demonstrate how an
16 English word is used in a sentence.

17
18 81. A cross-language writing architecture as recited in claim 80,
19 wherein the spelling tool comprises:

20 a Chinese-English dictionary to determine possible English word
21 candidates from the Chinese words;

22 an English language model to determine how likely the user intended the
23 English word candidates given previously entered English words; and

24 an English-Chinese translation model to determine how likely individual
25 Chinese words were intended given the English word candidates.

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2 **82.** A cross-language writing architecture as recited in claim 80,
3 wherein the sentence recommendation tool comprises:

4 a bilingual corpus containing bilingual sentence pairs written in both
5 English and Chinese; and

6 a sentence retrieval unit to retrieve bilingual sentence pairs from the
7 bilingual corpus.

8
9 **83.** A word processor comprising the language input architecture as
10 recited in claim 80.

11
12 ~~**84.**~~ One or more computer-readable media having computer-executable
13 instructions that, when executed on a processor, direct a computer to:

14 enable entry of English words and Chinese Pinyin;
15 translate the Chinese Pinyin to at least one Chinese word;
16 determine possible English word candidates from the Chinese word;
17 generate first probabilities associated with the English word candidates that
18 indicate how likely each of the English word candidates was intended given
19 previously entered English words;

20 generate second probabilities associated with the English word candidates
21 that indicate how likely the Chinese word was intended given each of the English
22 word candidates;

23 derive a most probable English word from among the English word
24 candidates based on the first and second probabilities; and

25 translate the Chinese word to the most probable English word.